

BASEBAND POWER ESTIMATION AND FEEDBACK MECHANISM

PRIORITY CLAIM

[0001] This application is a continuation of Ser. No. 16/241,107 titled “Baseband Power Estimation and Feedback Mechanism” and filed Jan. 7, 2019, whose inventors are Sunny Arora, Rati Agrawal, Sami M. Almalfouh, Xiantao Sun, Johnson O. Sebeni, Wael S. Barakat, Navid Damji, Srinivas Pasupuleti, Raghuvveer Mallikarjunan, which is a continuation of Ser. No. 15/838,580 titled “Baseband Power Estimation and Feedback Mechanism” and filed Dec. 12, 2017, now U.S. Pat. No. 10,200,957 whose inventors are Sunny Arora, Rati Agrawal, Sami M. Almalfouh, Xiantao Sun, Johnson O. Sebeni, Wael S. Barakat, Navid Damji, Srinivas Pasupuleti, Raghuvveer Mallikarjunan, which is a continuation of Ser. No. 15/169,280 titled “Baseband Power Estimation and Feedback Mechanism” and filed May 31, 2016, now U.S. Pat. No. 9,860,848, whose inventors are Sunny Arora, Rati Agrawal, Sami M. Almalfouh, Xiantao Sun, Johnson O. Sebeni, Wael S. Barakat, Navid Damji, Srinivas Pasupuleti, Raghuvveer Mallikarjunan, and which are both hereby incorporated by reference in their entirety as though fully and completely set forth herein.

[0002] The claims in the instant application are different than those of the parent application or other related applications. The Applicant therefore rescinds any disclaimer of claim scope made in the parent application or any predecessor application in relation to the instant application. The Examiner is therefore advised that any such previous disclaimer and the cited references that it was made to avoid, may need to be revisited. Further, any disclaimer made in the instant application should not be read into or against the parent application or other related applications.

FIELD

[0003] The present application relates to wireless devices, and more particularly to systems, methods, and apparatuses for estimating baseband power usage and using that information for baseband operation decision making.

DESCRIPTION OF THE RELATED ART

[0004] Wireless communication systems are rapidly growing in usage. Additionally, there exist numerous different wireless communication technologies and standards. Some examples of wireless communication standards include GSM, UMTS (associated with, for example, WCDMA or TD-SCDMA air interfaces), LTE, LTE Advanced (LTE-A), HSPA, 3GPP2 CDMA2000 (e.g., 1xRTT, 1xEV-DO, HRPD, eHRPD), IEEE 802.11 (WLAN or Wi-Fi), IEEE 802.16 (WiMAX), Bluetooth, and others.

[0005] Many wireless communication technologies, such as cellular communication technologies, are substantially designed to provide mobile communication capabilities to wireless devices, such as cellular phones. Accordingly, wireless devices are generally powered by a portable power supply, e.g., a battery. As batteries hold a finite charge, the balance between techniques that reduce power consumption to improve battery life, and techniques that provide higher throughput, commonly results in less-than-ideal design trade-offs for wireless devices. Thus, improvements in the field would be desirable.

SUMMARY

[0006] Embodiments are presented herein of, inter alia, systems, methods, and apparatuses for estimating baseband power usage in a wireless device and for utilizing the estimated baseband power usage information during baseband operations.

[0007] According to the techniques described herein, a wireless device may be provided with the capability to estimate its baseband power usage in real time, through knowledge of the system and characterization (e.g., via a series of characterization tests) of the effects on baseband power consumption of the various baseband features and characteristics (e.g., configuration settings) of the system.

[0008] According to some embodiments, an additive model may be used, such that the baseband power consumption is estimated by computing a linear combination of whichever power modifying characteristics features are identified as being active during an estimation window.

[0009] The estimated baseband power consumption computed in such a way may be used within and/or outside of the baseband portion of the wireless device. For example, the estimated baseband power consumption (and/or one or more metrics derived therefrom) may be used as a feedback input for baseband operations, such that certain baseband operation characteristics (e.g., features turned on or off, timing of certain operations) may be selected or modified based at least in part on the estimated baseband power consumption. Alternatively or in addition, the estimated baseband power consumption (and/or one or more metrics derived therefrom) may be provided to higher layers (e.g., to one or more applications or other modules operating on an application processor/domain of the wireless device), and may be used as part of their operations (e.g., for determining network data exchange timing, for providing a power consumption meter or battery level user interface, etc.)

[0010] Note that the techniques described herein may be implemented in and/or used with a number of different types of devices, including but not limited to, base stations, access points, cellular phones, portable media players, tablet computers, wearable devices, and various other computing devices.

[0011] This summary is intended to provide a brief overview of some of the subject matter described in this document. Accordingly, it will be appreciated that the above-described features are merely examples and should not be construed to narrow the scope or spirit of the subject matter described herein in any way. Other features, aspects, and advantages of the subject matter described herein will become apparent from the following Detailed Description, Figures, and Claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] A better understanding of the present subject matter can be obtained when the following detailed description of the embodiments is considered in conjunction with the following drawings, in which:

[0013] FIG. 1 illustrates an exemplary (and simplified) wireless communication system, according to some embodiments;

[0014] FIG. 2 illustrates a base station (BS) in communication with a user equipment (UE) device, according to some embodiments;